

CLAIMS:

- 5 1. A look up engine comprising a storage means for storing a plurality of entries, each entry comprising a value and an associated key value, such that, in operation, a look up is carried out by outputting a value which is associated with the stored key value which matches an input key value,
10 the look up engine comprising a plurality of look up state machines connected in parallel to enable multiple look ups to be carried out concurrently.
- 15 2. A look up engine according to claim 1, wherein the entries are stored in a trie structure.
3. A look up engine according to claim 2, wherein the trie structure is a PATRICIA trie structure.
- 20 4. A look up engine according to claim 1 further comprising an input buffer and an output buffer.
- 25 5. A look up engine according to claim 4, wherein the look up engine further comprises a distributor for distributing the input key values between the plurality of look up state machines.
- 30 6. A look up engine according to claim 5, wherein the look up engine further comprises a collector for collecting the outputs from the plurality of look up state machines for outputting the lookup value.
- 35 7. A look up engine according to claim 1, wherein the length of the key values and the values is fixed.
8. A look up engine according to claim 1, wherein the length of the key value and the values is variable.
- 40 9. A look up engine according to claim 1, wherein the look up engine further comprises a tagging mechanism in which each key value has a tag associated therewith such that the output values can be ordered in accordance with the order of receipt of the input key value.
- 45 10. A look up engine according to claim 1, wherein the look up engine comprises means for storing the identity of a requestor requesting

look up for each look up request such that the output value is sent to the correct location.

- 5 11. A look up engine according to claim 1,
wherein at least one of the output values
comprises an error message which is output to
indicate a look up failure.
- 10 12. A look up engine according to claim 11,
wherein the error message further comprising
additional data including indication of the type
of error.
- 15 13. A look up engine according to claim 12,
wherein the additional data includes indication of
the number of bits of the input key value which
matched.
- 20 14. A look up engine according to claim 11,
wherein each entry further comprises a skip value
and each key value comprises a plurality of bits,
and wherein the error message is sent if the skip
value mismatches the skipped bits of the input key
value.
- 25 15. A look up engine according to claim 1,
wherein the storage means comprises internal
and/or external memory.
- 30 16. A look up engine according to claim 15,
wherein the storage means comprises a plurality of
independent, parallel memory banks, each memory
bank containing at least one table of the
plurality of entries.
- 35 17. A look up engine according to claim 16,
wherein the tables are mutually exclusive.
- 40 18. A look up engine according to claim 17,
wherein the input key value comprises a table
identifier for identifying which of the tables is
required.
- 45 19. A look up engine according to claim 15,
wherein the look up state machines can be bypassed
in operation such that the storage means is
utilised as memory for a processing means.
- 50 20. A look up engine according to claim 19,
wherein the storage means is dynamically

partitioned for use as memory by the processing means and for storing the plurality of entries.

- 5 21. A method for looking up a value, the method comprising the steps of:
- (a) receiving a key value;
 - (b) comparing the input key value with a plurality of stored key values;
 - (c) outputting the value associated with the stored key value that matches the input key value, wherein steps (a), (b) and (c) are carried out concurrently.
- 10
- 15 22. A method for looking up a value, the method comprising the steps of:
- (a) receiving a key value;
 - (b) dividing the input key value into a plurality of predetermined portions;
 - (c) comparing each predetermined portion of the input key value with a plurality of stored key values;
 - (d) outputting the value associated with the stored key value that matches the predetermined portion of the input key value;
 - (e) assembling each looked up value to produce a final key value;
 - (f) comparing the final key value with a plurality of stored key values; and
 - (g) outputting the value associated with the stored key value that matches the final key value, wherein steps (b) to (d) are carried out concurrently.
- 20
- 25
- 30
- 35 23. A computer system comprising a plurality of processing means interconnected via a bus system, the computer system further comprising a look up engine, the look up engine comprising a storage means for storing a plurality of entries, each entry comprising a value and an associated key value, such that, in operation, a look up is carried out by outputting a value which is associated with the stored key value which matches an input key value, the look up engine comprising a plurality of look up state machines connected in parallel to enable multiple look ups to be carried out concurrently.
- 40
- 45
- 50 24. A computer system according to claim 23, wherein the look up engine is connected to the bus system via a plurality of parallel interface

units, the interface units allowing concurrent update of the entries and look up.

- 5 25. A computer system according to claim 23,
 wherein multiple keys are submitted for look up in
 a single bus transaction.
- 10 26. A look up engine comprising at least one
 storage means for storing a plurality of entries,
 each entry comprises a key value, an associated
 value and a skip value, such that, in operation a
 look up is carried out by outputting a value which
 is associated with the stored key value which
15 matches an input key value, the input key
 comprising a plurality of bits, if the skipped
 bits of the input key value and the associated
 skip value mismatches, an error message is output
 to indicate lookup failure.
- 20 27. A look up engine according to claim 26,
 wherein the error message further comprising
 additional data including indication of the type
 of error.
- 25 28. A look up engine according to claim 26,
 wherein multiple look ups are carried out
 concurrently.
- 30 29. A method for looking up a value, each value
 having a key value and a skip value associated
 therewith, the method comprising the steps of:
 receiving a key value comprising a plurality
 of bits;
 comparing the input key value with a
35 plurality of stored key values;
 comparing the skip value associated with the
 value corresponding to the input key value
 with the skipped bits of the input key value;
 outputting the value associated with the
40 stored key value that matches the input key
 value if the skip value matches the skipped
 bits of the input key value, and outputting
 an error message to indicate look up failure
 if the skip value does not match the skipped
45 bits of the input key.
- 50 30. A method according to claim 29, wherein the
 output error message comprises additional data
 including an indication of the type of error.

31. A method according to claim 29, wherein multiple look ups are carried out concurrently.
- 5 32. A method of constructing a trie in a storage means, the trie comprising a plurality of entries, the method comprising the steps of:
identifying overlapping ranges between the plurality of entries;
10 splitting the identified overlapping ranges;
storing the plurality of entries within a trie structure.
- 15 33. A method according to claim 32, wherein the depth of the trie is programmable.
34. A method according to claim 33, wherein the entries are arranged in a PATRICIA trie.
- 20 35. A method according to claim 32, wherein, the method further comprises the step of:
providing each entry with a skip value such that, during the look up operation, the skip value associated with the value corresponding to the input key value is compared with the
25 skipped bits of the input key value;
outputting the value associated with the stored key value that matches the input key value if the skip value matches the skipped bits of the input key value, and outputting an error message to indicate look up failure
30 if the skip value does not match the skipped bits of the input key.
- 35 36. A look up engine constructed and updated in accordance with a method of constructing a trie in a storage means, the trie comprising a plurality of entries, the method comprising the steps of:
identifying overlapping ranges between the plurality of entries;
40 splitting the identified overlapping ranges;
storing the plurality of entries within a trie structure.
- 45

20240220-22042001